

**WHAT IS CLAIMED IS:**

1           1. An apparatus for recording and displaying holographic stereograms  
2 comprising:  
3           a light source that produces a coherent beam;  
4           a beam splitter that splits the coherent beam into an object beam and a  
5           reference beam;  
6           an object beam optical system for directing the object beam to interfere with  
7           the reference beam at an updateable holographic recording material;  
8           a reference beam optical system for directing the reference beam to interfere  
9           with the object beam at the updateable holographic recording material;  
10           a material holder holding the updateable holographic recording material; and  
11           an illumination source oriented with respect to the updateable holographic  
12           recording material so as to illuminate at least one hogel recorded in the  
13           updateable holographic recording material for viewing by a user.

1           2. The apparatus of claim 1 wherein the updateable holographic recording  
2 material further comprises at least one hogel region, wherein the at least one hogel  
3 region is operable to store the at least one hogel and substantially erase the at least one  
4 hogel so that at least another hogel can be stored in the at least one hogel region.

1           3. The apparatus of claim 2 wherein at least one of a voltage source, a heat  
2 source, the light source that produces a coherent beam, and a second light source is  
3 used to substantially erase the at least one hogel so that at least another hogel can be  
4 stored in the at least one hogel region.

1           4. The apparatus of claim 2 wherein the at least one hogel region is operable  
2 to substantially erase the at least one hogel using a natural decay property of the  
3 updateable holographic recording material.

1           5. The apparatus claim 1 wherein the updateable holographic recording  
2 material further comprises at least one of a photopolymer, a photorefractive material, a  
3 chalcogenide compounds, a thermally-deformable material, a liquid crystal material,

4 polymer-dispersed liquid crystal material, and an optically addressable spatial light  
5 modulator.

1       6. The apparatus of claim 1 wherein the material holder further comprises:  
2       a material supply portion; and  
3       a material take-up portion, wherein the updateable holographic recording  
4       material further comprises a flexible film disposed on the material  
5       supply and material take-up portions.

1       7. The apparatus of claim 1 wherein the updateable holographic recording  
2       material further comprises:  
3       a first hogel region, wherein the first hogel region is operable to store the at  
4       least one hogel; and  
5       a second hogel region wherein the second hogel region is operable to store an  
6       updated version of the at least one hogel.

1       8. The apparatus of claim 1 wherein the updateable holographic recording  
2       material further comprises at least one substrate coupled to the updateable holographic  
3       recording material.

1       9. The apparatus of claim 8 wherein the at least one substrate coupled to the  
2       updateable holographic recording material includes at least one electrode.

1       10. The apparatus of claim 1 wherein the object beam optical system includes  
2       a spatial light modulator for intensity modulating the object beam.

1       11. The apparatus of claim 1 further comprising:  
2       a computer coupled to the spatial light modulator and programmed to control  
3       delivery of a rendered image to the spatial light modulator.

1       12. The apparatus of claim 1 further comprising:  
2       an object beam optical system translation system operable to position the  
3       object beam optical system with respect to the updateable holographic  
4       recording material.

1       13. The apparatus of claim 1 further comprising:  
2       a reference beam optical system translation system operable to position the  
3       reference beam optical system with respect to the updateable  
4       holographic recording material.

1       14. The apparatus of claim 1 wherein the light source that produces a coherent  
2       beam is a pulsed laser.

1       15. A method of recording and displaying holograms comprising:  
2       providing an updateable holographic recording material;  
3       exposing a first portion of the updateable holographic recording material to a  
4       first interference pattern formed by a reference beam from a laser and  
5       an object beam from the laser;  
6       forming a hogel in the first portion of the updateable holographic recording  
7       material corresponding to the first interference pattern formed by the  
8       reference beam from the laser and the object beam from the laser;  
9       illuminating the hogel;  
10      exposing a second portion of the updateable holographic recording material to  
11      a second interference pattern formed by the reference beam from the  
12      laser and the object beam from the laser;  
13      forming an updated hogel in the second portion of the updateable holographic  
14      recording material corresponding to the second interference pattern  
15      formed by the reference beam from the laser and the object beam from  
16      the laser; and  
17      illuminating the updated hogel.

1           16. The method of claim 15 wherein the first portion of the updateable  
2       holographic recording material coincides with the second portion of the updateable  
3       holographic recording material, the method further comprising:  
4           at least partially erasing the hogel.

1           17. The method of claim 16 wherein the at least partially erasing the hogel  
2       further comprises at least one of:  
3           applying a voltage to the hogel;  
4           heating the hogel;  
5           applying light from a light source to the hogel; and  
6           delaying the exposing the second portion of the updateable holographic  
7           recording material until a predetermined time interval has elapsed.

1           18. The method of claim 15 wherein the updateable holographic recording  
2       material further comprises at least one of a photopolymer, a photorefractive material, a  
3       chalcogenide compounds, a thermally-deformable material, a liquid crystal material,  
4       polymer-dispersed liquid crystal material, and an optically addressable spatial light  
5       modulator.

1           19. The method of claim 15 wherein the first portion of the updateable  
2       holographic recording material is separate from the second portion of the updateable  
3       holographic recording material.

1           20. The method of claim 15 wherein the exposing the holographic recording  
2       material further comprises:  
3           orienting at least one of the reference beam and the object beam at an arbitrary  
4           angle with respect to the updateable holographic recording material.

1           21. The method of claim 15 further comprising:  
2           translating an object beam optical system with respect to the updateable  
3       holographic recording material.

- 1        22. The method of claim 15 further comprising:  
2                translating a reference beam optical system with respect to the updateable  
3                holographic recording material.
  
- 1        23. The method of claim 15 further comprising:  
2                intensity modulating the object beam with a spatial light modulator.
  
- 1        24. The method of claim 23 further comprising:  
2                delivering at least one rendered image to the spatial light modulator.
  
- 1        25. The method of claim 15 wherein the updateable holographic recording  
2                material is a flexible film and wherein the providing the updateable holographic  
3                recording material further comprises:  
4                advancing a first portion of the flexible film; and  
5                taking up a second portion of the flexible film.
  
- 1        26. The method of claim 15 wherein the laser is a pulsed laser.